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Credit: Mark Floyd Oregon State University

Agrivoltaics: Solar Energy Production Paired with Agricultural Use

March 31, 2021 Hosted by Amy Berg Pickett

Intro Host

Credit: Danner Boots in photo Eric Prizzia & Amy Berg Pickett Bend, OR

Webinar Sponsor

Spark Northwest

Credit: Spark Northwest

Washington State Department of Commerce

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Intro to Topic

- Ag Land vs Solar Energy
- Undisturbed Land vs Human Disturbed landscapes
- State & National Goals
- Customer Demand
- Colocation of Land Use
- Policy, Perception, Design Considerations

Credit: Cypress Creek EPC

Uses-Pollinator Habitat Creation

- Native Forbs
- Native Grasses

Credit: Understory Consulting Sean Prive

Apiaries

Credit: Pine Gate Renewables

Grazing

Credit: Oregon State University

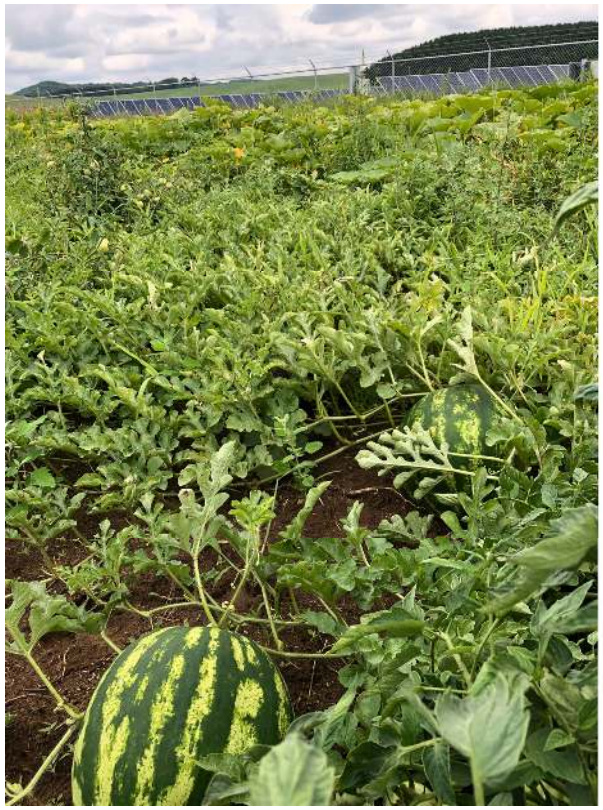
Crops-Seed Production & Food Crops

Credit: Understory Consulting Sean Prive

Benefits

- Income diversification
- Sustainable development practices,
- Habitat restoration & creation,
- Agricultural products,
- Carbon sink
- Water conservation,
- Soil Quality
- Sediment & erosion conservation,
- Increased biodiversity
- Community Benefits
- Clean Energy

Case Study-Amish Farmer's Organic Crops



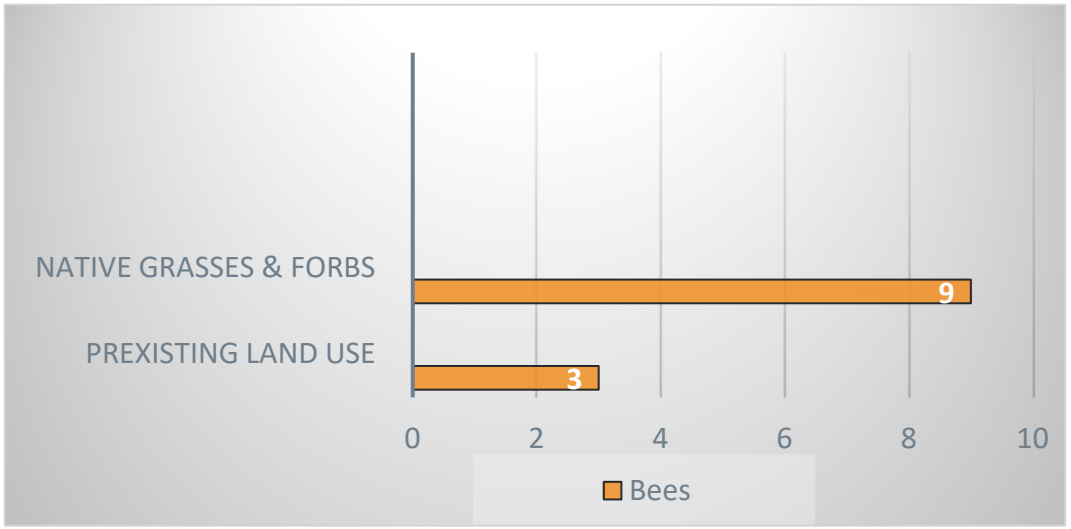
- Pollinator Dependent Crops
- Pollinator Friendly Solar Array
- Compatible and Complementary Uses

Credit: Rob Davis Fresh Energy Center for Pollinators in Energy

Findings-Native Grasses and Forbs

Pollinator Supply (Pollinator Insect Quantity) 3 X's increase vs previous use of land

Native Grassland Restoration in Array



95% ↑ Soil

Leroy J. Walston et al, Modeling the ecosystem services of native vegetation management practices at solar energy facilities in the Midwestern United State, 2021 (see last slide for citation)

Case Study-Pollinator Habitat Creation & Seed Production

- Photo: second year wildflower crop
- Planted as Pollinator Habitat
- Understory Consulting, LLC
- Guest Speaker: Sean Prive

M.S. Oregon State University / B.S. Evergreen State College / Restoration Ecologist / Botanist

Credit: Understory Consulting Sean Prive

Case Study- Apiary-Oregon

Eagle Point Solar-Jackson County

- 67.5 ac previous use subpar grazing
- Adjacent to Harry & David Pear Orchards
- 10MW 46.5 ac Utility Scale Solar operation 2018
- 57 honeybee hive Apiary
- Old Sol Bees & Apiaries
- Guest Speaker: John Jacobs
- President Oregon State Beekeepers Association

Credit: Pine Gate Renewables

Grazing

- Livestock on Solar Farm
- Maintenance of Vegetation
- Shelter for Sheep

Credit: nrel.gov sunraisedfarms.com

Research

Oregon State University

Findings

- Improved Animal Welfare
- 200% ↑ Land Carrying Capacity

Alyssa C. Andrew et al 2020 (see last for citation)

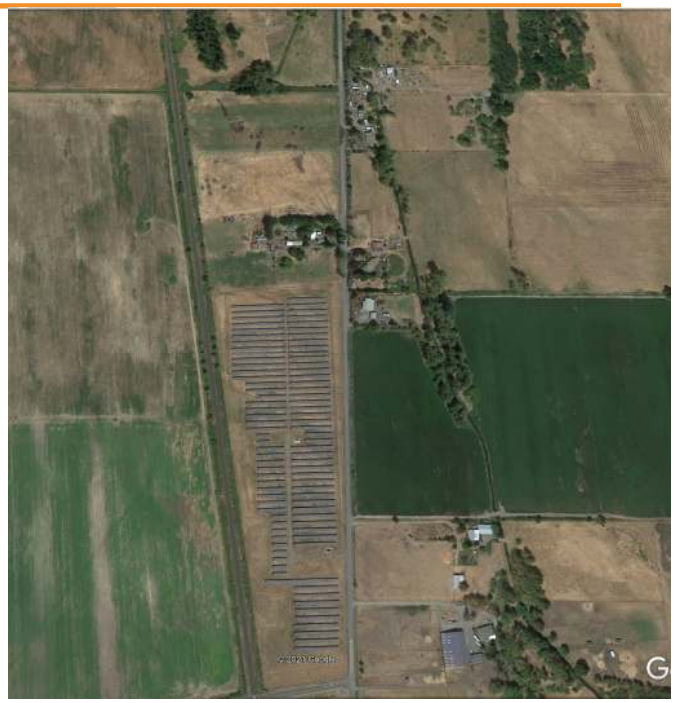
Guest Speaker: Trent Hendricks of Cabriejo Ranch

Case Study-Sheep Grazing-Oregon

Sheep Solar-Marion County

- 40 ac. Sheep Ranch
- 3MW 17-acre Utility Scale Solar operational 2018
- Vegetation Maintenance
- Landowner & Sheep Love it!
- Shelter Shade In Summer & Protection from Rain

Credit: Amy Berg Pickett



Credit: Google Earth

Case Study- Solar Harvest

- Oregon Community Solar Project & Agrivoltaics Research Project

Oregon State University

College of Agricultural Sciences

Prof. Chad Higgins
Assoc. Professor
Biological and Ecological Engineering

OREGON CLEAN POWER COOPERATIVE
COMMUNITY-OWNED RENEWABLE ENERGY

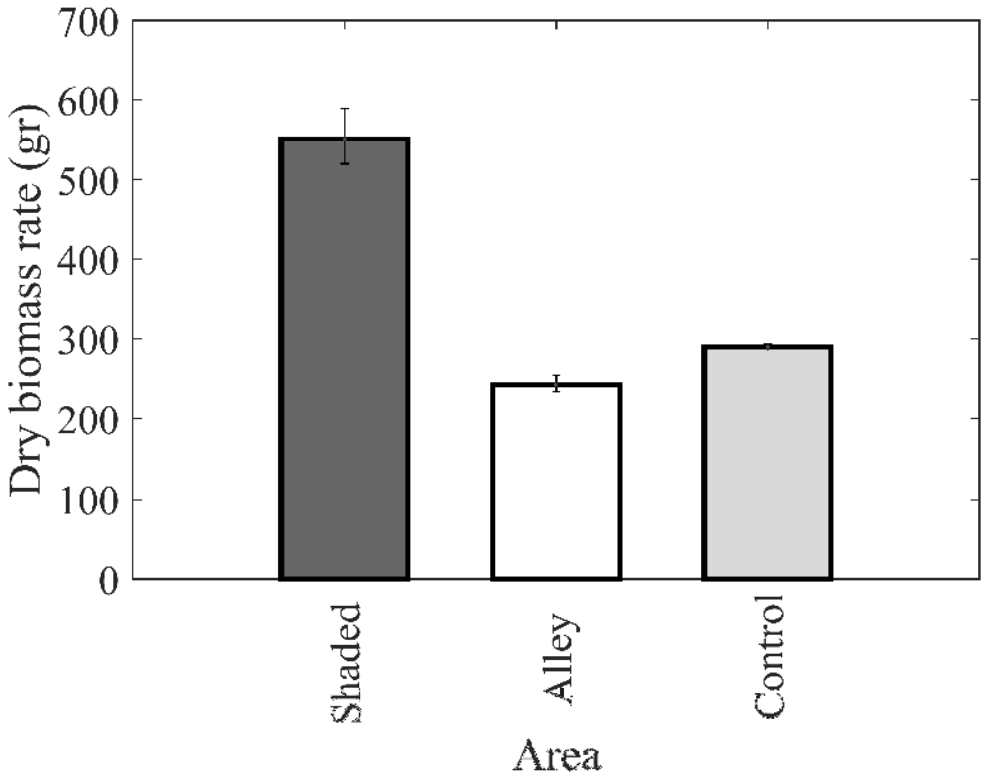
Dan Orzech
General Manager

Guest Speaker: Dan Orzech


SOLAR HARVEST CONCEPT
CONFIDENTIAL
WIRING DIAGRAM

BIOMASS PRODUCTION ROUGHLY DOUBLED

PLANT WATER-USE EFFICIENCY TRIPLED



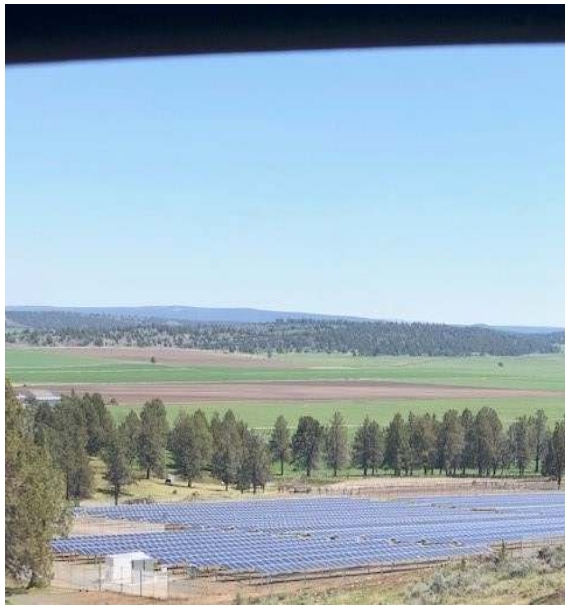
Hassanpour E**, Selker JS, **Higgins CW**, 'Remarkable solar panel influence on soil moisture, micrometeorolory and water use efficiency.' *Plos1, 2018,*

Major Global and National Impacts

- ~1% of cropland would offset the global energy demand if converted to agrivoltaics.
- ~1% of US cropland would reach the nation's sustainable energy targets, costing ~1% of the annual budget.
- Re-purpose excess energy to make agriculture more sustainable.

Findings-Siting on Agricultural Land

Efficiency of PV Equipment



Credit: Amy Berg Pickett Sunstone Energy, LLC

"The top three land covers associated with greatest solar PV power potential are croplands, grasslands and wetlands. Solar panels are most productive with plentiful insolation, light winds, moderate temperatures and low humidity. These are the same conditions that are best for agricultural crops….." Elnaz H. Adeh et al, Scientific Reports 08.07.19

Design Considerations & Policy Wish List

- Enact policy for streamlining process and encourages the opportunity to design & operate sustainable Agrivoltaic Systems.
- Remove arbitrary Limitations
- Prioritize education on PV infrastructure as a key element of a farm operation
- Policy Wish list, pollinator Score Card, Agrivoltaic siting incentives

Contact Information

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- amy@sunstone.energy

Resources

American Solar Grazing Association https://solargrazing.org/what-is-solar-grazing/	Old Solar Apiaries https://oldsolbees.com John Jacobs oldsolbees@gmail.com
Understory Consulting, LLC https://www.understoryconsulting.net/ Sean Prive sean@understoryinitiative.org	Oregon Clean Power Cooperative https://oregoncleanpower.coop/ Dan Orzech Info@oregoncleanpower.coop
Cabriejo Ranch https://cabriejoranch.com/ Trent Hendricks trenth@cabrieforanch.com https://www.linkedin.com/in/trent-hendricks-us-a855166	Sunstone Energy, LLC https://www.sunstone.energy/ Amy Berg Pickett amy@sunstone.energy https://www.linkedin.com/in/sustainablesolar/
Oregon State University Chad Higgins Associate Professor chad.higgins@oregonstate.edu	Spark Northwest Connecti@sparknorthwest.org
Solar PV Power Potential is Greatest Over Croplands Elnaz H. Adeh, Stephen P. Good, M. Calaf & Chad W. Higgins Scientific Reports www.nature.com/scientificreports (2019) 9:11442 | https://doi.org/10.1038/s41598-019-47803-3	Modeling the ecosystem services of native vegetation management practices at solar energy facilities in the Midwestern United States Leroy J. Walston, Yudi Li, Heidi M. Hartmann, Jordan Macknick, Aaron Hanson, Chris Nootenboom, Eric Lonsdorf, Jessica Hellmann Ecosystem Services www.elsevier.com/locate/ecoser (2020) https://doi.org/10.1016/j.ecoser.2020.101227